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ABSTRACT

The 1993-94 Integrated Learning System (ILS) project, a means of delivering individualized instruction through a computer network, involved approximately 70 schools from New York City school districts. To help schools learn about and operate the technology in an ILS, districts were given the option of hiring one of the following companies (referred to as education systems integrators): Instructional Systems Inc., Jostens, the Waterford Institute, and Titan. Of the four integrators, Titan elected to have the Office of Educational Research (OER) evaluate its program. Titan, who was chosen as integrator by six schools, contracted with Computer Networking Specialists (CNS) on Long Island to perform the integration services, and with the Waterford Institute to provide teacher training. Two of the six schools were part of the grantback phase and the other four were in the capital phase of the project. Problems resulting from the asbestos crisis in New York City public schools and delayed deliveries and installations affected both phases of the project, but especially the capital phase. Half of the schools were very satisfied with the teacher training they received, while the other half voiced dissatisfaction with the initial training. Opinions about the software programs were mixed; one area of dissatisfaction was the schools' involvement in decision making about the ILS project. Student achievement scores showed no significant differences in reading between program participants and the rest-of-school population. Recommendations include: reexamine teacher training; clarify the roles of CNS and Waterford; and consider how the program expects schools to integrate the use of the ILS lab. (AEF)

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OER Report

Educational Systems Integrators/ Integrated Learning System Project: Titan Schools 1993-94

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EXECUTIVE SUMMARY

The 1993-94 Integrated Learning System (I.L.S.) project involved approximately 70 schools in almost every New York City community school district. I.L.S. is a means of delivering individualized instruction in various curriculum areas through a network of computers.

To help schools learn about and operate the computers and software in an I.L.S., districts were given the option of hiring companies that were experts in the use of such systems. Previously, the Board of Education of the City of New York had reviewed proposals and selected four companies (referred to as educational systems integrators) from which schools and districts might choose: Instructional Systems Inc., Jostens, the Waterford Institute, and Titan. Of the four integrators, Titan elected to have the Office of Educational Research (OER) evaluate its program.

Titan, which is based in Colorado, was chosen as integrator by six schools. Titan, in turn, contracted with Computer Networking Specialists (C.N.S.) on Long Island to perform the integration services for them, and with the Waterford Institute to provide teacher training. Of the six schools which chose Titan as integrator, two were part of the grantback phase and the other four were in the capital phase of the project. The grantback phase began close to schedule, with computers delivered in early autumn 1993 or before the school year started. Schools in the capital phase, however, did not begin using their computers until 1994. A variety of problems resulting from the asbestos crisis in New York City public schools, as well as delayed deliveries and installations affected both phases of the project, but especially the capital phase.

Schools were unanimous in their opinion that the C.N.S. representative was professional, knowledgeable, responsive to problems and needs, and a pleasure to work with. However, the length of time it occasionally took C.N.S. to get to one of the schools to fix a system problem was a concern.

Half of the schools were very satisfied with the teacher training they received from the Waterford Institute, while the other half voiced dissatisfaction with the initial training in several areas: the amount of time allocated for training; the topics covered; and, in one case, the trainer's manner of presenting the topics.

Trainers from C.N.S. or Waterford spent a good deal of time with the schools' lab managers to ensure that they could operate the system software, enroll students, change placements, etc. As the project was implemented, teachers relied on these lab managers, since they were the ones trained to use the system.

Opinions about the software programs were mixed. Although many teachers thought the lesson software was beneficial to students, others said students found it boring. A considerable number of teachers said that the software did not fit their schools' curricula, so that they had difficulty integrating it into classroom activities.

One area of dissatisfaction was the schools' involvement in decision making about the I.L.S. project. Most school administrators reported that they had little or no input into initial decisions about what integrator or software to use, and teachers had even less.

Student achievement scores showed no significant differences in reading between program participants and the rest-of-school population. Mathematics scores indicated a trend towards differences in grade 3. However, this trend favored the rest-of-school population, not program participants.

Based on these findings, OER makes the following recommendations:

- Reexamine the teacher training process to clarify such aspects as how much and what kinds of training teachers need before students begin to use the I.L.S. system, and what kind of ongoing support teachers need to ensure successful student use of the lab.

- Clarify more completely the roles of C.N.S. and Waterford in delivering technical and educational support to schools.

- Consider how the program expects schools to integrate use of the I.L.S. lab with the rest of their curricula, and how systems integrators will work with schools to effect this integration.

ACKNOWLEDGEMENTS

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I. INTRODUCTION

INTEGRATED LEARNING SYSTEM PROJECT

An Integrated Learning System (I.L.S.) is a means of delivering individualized instruction in various curriculum areas through a network of computers. Individual microcomputers are connected to a central microcomputer (also called a file server), controlled by a teacher or computer lab manager, which sends the programs students use to their separate computers. A computer network can simply provide a variety of software for users to access. In an I.L.S., however, the system software plays an integral role in managing students' progress through skill levels. The software typically tests students before they begin the software lessons to provide initial placement at the correct skill level. It then delivers lessons to students, assesses their performance, and adjusts their levels accordingly. Lab managers, or teachers, can at any point change students' levels, select skill areas or subject areas for software lessons, and change the sequence in which the lessons are presented. I.L.S. which are intended to benefit students of elementary school age, provide a number of reports, including profiles of skills covered by a class and progress for individual students, which teachers can use to help them make decisions about student placement and what they want the software to cover.

The 1993-94 I.L.S. project involved approximately 70 schools in almost every New York City community school district. Almost every school district elected to place their computer labs in

elementary schools, but a few put them in intermediate schools to be used by fifth or sixth graders.

The project proceeded in two phases. The first, financed by funds from the federal Chapter 1 program,* was called the "grantback" phase and was scheduled to begin at the beginning of the 1993-94 school year. The second, with funds from the New York City Council, was known as the "capital" phase and was intended to begin later in the fall of 1993.

To help schools learn about and operate the computers and software involved in an I.L.S., districts were given the option of hiring companies that were experts in the use of such systems (hereafter referred to as educational system integrators) who performed a variety of services. Their roles included coordinating the delivery and installation of computer equipment and security devices, installing the I.L.S. software, training teachers and other school personnel in using the computers and software, troubleshooting problems, and continuing to help school personnel throughout the year. The Board of Education of the City of New York, in the previous school year, had reviewed proposals and selected four integrators from which schools and

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*Chapter 1 is a federal funding source for remediation programs that address student needs in basic reading, writing, mathematics, and English-language skills. A school is eligible for Chapter 1 funds if its percentage of low income students is equal to or greater than the citywide average based on a formula which calculates students' eligibility for free lunch and Aid to Families with Dependent Children (A.F.D.C.). Students are eligible for Chapter 1 remediation programs when they score below the state reference point on standardized tests.

districts might choose: Instructional Systems Inc., Jostens, the Waterford Institute, and Titan.

As part of its contract, each integrator was required to provide an evaluation of their services during the 1993-94 school year. Integrators were given the option of hiring their own evaluators or of having the Office of Educational Research (OER) of the Board of Education of the City of New York conduct the evaluation.

Of the four integrators, Titan elected to have OER evaluate it. Titan, which is based in Colorado, was chosen as integrator by six schools. Titan contracted with Computer Networking Specialists (C.N.S.) of Long Island to perform the integration Services for them, and with the Waterford Institute to provide teacher training in the six schools. This report, therefore discusses the performance of C.N.S. and the Waterford Institute in their fulfillment of the various integrator roles.

To clarify the ensuing discussion, some description of I.L.S. software is necessary. Some I.L.S.s use software specially developed for them; that is, all of the software lessons, and the software that manages students' progress through the program, was developed by one source. Jostens is one example of this kind of system; Instructional Systems, Inc. which is a franchise of the Computer Curriculum Corp. and uses only its software, is another.

C.N.S. uses what is known as a more "open" system, because it uses parts of commercially available software and then creates

the management system that links the lessons together. C.N.S. thus has the ability to use a variety of software in its system. The Waterford Institute helps schools use whatever software the schools decide upon. In their role as subcontractor to Titan in this project, Waterford was responsible for training teachers in schools which had chosen to use the C.N.S. system.

EVALUATION METHODOLOGY

Of the six schools which chose Titan as an integrator, two were part of the grantback phase and the other four were in the capital phase of the project. The grantback phase began close to schedule, with computers delivered in early autumn 1993 or, in some cases, even before the school year started. Schools in the capital phase, however, did not begin using their computers until 1994, in some cases not until March or April. A variety of problems resulting from the asbestos crisis in New York City schools delayed deliveries and installation, and affected both phases of the project, but especially the capital phase.

Because the two groups of schools had access to the labs for different periods of time, this evaluation treats the two phases of the project differently. Topics covered for the two grantback schools encompass the entire school year and included the following: the installation and setup of equipment and software; initial training of school staff; how the labs have been used throughout the year; ongoing work with integrators; general satisfaction with all aspects of integrators' performance; school personnel's satisfaction with the I.L.S. software and their

perceptions of how it affected students; and academic achievement attributable to use of the system. Since the four capital schools had only a short time to begin using their labs, however, this evaluation covers only lab setup and installation, initial training and subsequent work with integrators, use of the labs to date, problems that have occurred, and school personnels' perceptions of (or hopes for) benefits to be derived from using the system. No conclusions about students' academic achievement or overall satisfaction with integrators' work are drawn for the capital schools.

Furthermore, the two schools in the grantback phase of the project were dissimilar in important ways. One was an alternative minischool for a small number of middle school-age students who had had problems in their original schools, while the other was a much larger elementary school in which 14 classes of upper elementary-age students used the lab. These two schools are therefore described first in Chapter II of this report. The four schools in the capital phase were all elementary schools using the labs for a range of ages, and are discussed together later in the chapter.

In conducting this study, evaluators:

- reviewed relevant program documents, including those from the Office of Technology of the central Board and from integrators;
- observed students using I.L.S. labs;
- interviewed administrators, teachers, and lab managers in project schools, as well as C.N.S. and Waterford personnel; and

- administered questionnaires to teachers, lab managers, and administrators in project schools.

SCOPE OF THIS REPORT

Chapter I of this report describes I.L.S. and the 1993-94 project in New York City public schools, as well as the methodology for evaluating those schools in which Titan was chosen as the educational systems integrator. Findings for the two schools in the grantback phase of the project, and for the four capital phase schools, are presented in Chapter II. Chapter III offers conclusions and recommendations.

II. FINDINGS

SCHOOL A

Description of the School

School A is an alternative school for middle school students with emotional problems that prevent them from succeeding in traditional school settings. In May 1994 there were 57 students on record. According to the school's director, students average between three and six months at the school and are then mainstreamed back to their original schools, and almost all of them go on to graduate. The director also said that students showed a marked increase in reading levels while at the school.

The school has six teachers, each of whom teaches more than one subject to different grade levels. Three of the teachers elected to use the new computer lab, and they worked in the computer lab with all of the students in the school. The school has a program in which eighth graders leave the school at 11:00 a.m. on many days for occupational studies, such as working at a nearby senior center. Because of this, eighth graders used the computer lab much less than other students.

A teacher new to the school acted as the de facto computer lab manager, although she was a regular classroom teacher who covered language arts and mathematics for seventh graders. She was able to do this because of the small size of the school and because she had an extensive previous background working with computers. In fact, one of her primary reasons for coming to the

school this year was the opportunity to work with the new computer lab.

Installation and Operation of the I.L.S. Lab

According to the director, the district office made all the decisions about purchasing the lab, including the choice of integrator and software. The school was at first pessimistic about someone from the outside coming in and installing software without consulting with the school, but because of the personnel from C.N.S. and Waterford the project worked out excellently. The director reported no problems with hardware or software installation, which he called "a phenomenal effort by C.N.S.," which coordinated all the details beautifully. The director had nothing but the highest praise for the contact person from C.N.S. and the trainer from Waterford for their efforts throughout the year.

The I.L.S. lab opened in October 1993. It contains 20 color Macintosh computers with CD-ROM drives and a few printers (including one laser printer). A few additional Macintosh computers in the room were purchased with other funds. Since October, the eighth grade has used it once or twice a week, because they are out of the school a substantial portion of the time. The seventh grade has used it every day, and twice on most days, for periods of about 40 minutes. The seventh grade has used mathematics, language, and writing software, while the eighth grade has used math and language programs.

Staff Development and Training

Teachers who were to use the computer lab, plus the director, received three full days of initial training before students started coming to the lab. This training consisted of an introduction to computers and their terminology, the use of the computer operating system, an understanding of and experience using some of the C.N.S. lesson software, and using the I.L.S. management software for enrolling students and placing them.

Teachers reported a high degree of satisfaction with all aspects of the initial training, including the amount of time spent, the material covered, the staff developer's manner of presenting the material, and the printed material they received with the training. Because the training began before the school's computers were fully installed, one day was spent at the Waterford Institute's Manhattan office, where teachers said they enjoyed being able to concentrate on learning away from the school. The teachers and the director had high praise for the Waterford staff developer, both in the initial training period and through the rest of the year.

The teachers additionally noted that the training was successful in part because they had such a small group of teachers using the lab, and were able to benefit from the experience of the one highly experienced teacher mentioned above, who was able to help the other two teachers at all points. Without her, the director said, it might have been difficult to succeed. This teacher herself suspected that the initial

training by itself might not have been enough for someone unfamiliar with computers. Another teacher agreed that she "got us over some of the rough periods" in beginning to use the system. Nevertheless, he too felt that the three full days of training provided a solid background.

After the initial training period, according to the teachers, the C.N.S. contact was primarily responsible for working with them to continue learning about the software, the management system, and student placement in the system. The Waterford staff developer helped throughout the year with curriculum-related issues, such as breaking down the curriculum to make it fit better with classroom instruction, and with using software tools such as a word processor and spreadsheet. Teachers reported that they spent much time, during the initial training and after, learning computer applications that would help them professionally, such as using a database program to file information about their students, and using a word processor to write papers and report cards.

Curriculum Connections

Teachers in school A reported that, with the help of the staff developer from Waterford, they had progressed in connecting what their students did in the computer lab with their regular classroom curriculum. One teacher said "we've gone through and made a syllabus based on what we teach in CIMS* math and

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*The Comprehensive Instructional Management System (CIMS) mathematics project is a teacher-developed mathematics program for kindergarten through grade seven that includes teachers

language arts. We now link software lessons we select with CIMS lessons." Another teacher reported that the staff developer had "shown us how to break down the curriculum and take out pieces of the software to match it, setting up modules for what I teach." Both thought that the software now fit well into their own curriculum.

Personnel at School A did have some criticism of the I.L.S. software. One teacher said he would have liked to have science and social studies software. Another commented that the system contained software that seemed to be made for younger children than those they taught. Like the earlier comment by the director that the school was at first suspicious of outsiders coming in and making decisions about what kind of system and software the school would use, these comments reflect the lack of collaboration between the school and the integrator in making decisions about the school's desires and needs. The director felt that "it would have been better to revise the software curriculum beforehand to make it easier to integrate into our curriculum." Nevertheless, teachers and the director felt that the software proved to be successful in their school, largely because of the efforts of C.N.S. and Waterford personnel, and also because the skills covered in the software were ones that students needed.

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manuals, student workbooks, criterion-referred tests, and a computerized test scoring and reporting system for managing mathematics instruction.

A key feature of an I.L.S. is its ability to assess students' abilities and keep track of their progress. After eight months of using the lab, teachers at School A had not yet begun to make use of the system's reporting function, and some had not yet heard of it. The teacher who knew the most about computers did know the function existed but had not deemed it necessary to use it yet, since the teachers and students, in her opinion, had enough to do learning how to use the software. Teachers did know about the system's assessment capabilities, but did not think much of them. As one teacher explained, "The system does a little pre- and posttesting, but it doesn't really do assessment. Teachers decide at what level to let kids move ahead."

Perceptions of Benefits

Overall, teachers at School A perceived a number of benefits for their students in using the I.L.S. lab. One was students' enjoyment. Students liked using the software, and, according to teachers, liked the idea of using computers: "Not pulling out paper and pencil is wonderful to them." Students enjoyed editing their writing with a word processor rather than correcting it on paper: "They're a lot more creative sitting in front of a computer." One teacher reported that students did not regard their use of the lab as a subject-area class. Instead, to them it was a "computer class." They also had an easy time learning to use the software. After the staff developer spent some time introducing the hardware to them, most of them felt competent to

use any of it on their own. One teacher cautioned, however, that his students' enjoyment was related to their ability levels--these students tended to get frustrated easily if the software was not matched carefully to their competence.

Teachers mentioned other benefits of using this kind of software for their students. It prepares them for the future by teaching them to use and understand the workings of a computer. Using the numeric pad is useful for future job skills. Teachers also thought that, in general, the interactive drill, especially the math drill, was academically beneficial.

Teachers at School A also seemed pleased with their own use of the computers. They enjoyed learning to use them, learning useful applications, and using them with their students. One teacher commented proudly that he had previously been "just about computer illiterate, and now I can hold my own." Teachers reported using the computers to set up databases, do students' report cards, and network with their district's administrative database.

Academic Achievement

School A is an alternative school that acts as a transitional program for students with emotional problems. Students enter the program at different times and stay between three and six months before returning to a regular school setting. Therefore, achievement tests were not available to assess student achievement.

SCHOOL B

Setup and Overview of Lab Use

School B is an elementary school with four or five classes in each grade from kindergarten to fifth. Fourteen classes, from third to fourth grade, used the I.L.S. lab. Teachers reported that they had no prior knowledge of, or involvement with, decisions concerning the lab. They were told by the school administration that they were to participate.

All classes had between 25 and 30 students, and in all cases the classroom teacher stayed in the lab with the class. In addition, a lab manager, who was not a regular teacher, was in the lab at all times. Classes came to the lab either two or three times per week, for 45-minute sessions.

According to the lab manager, there were no problems with the delivery or installation of computer equipment and software. The lab of 25 Macintosh color computers was fully set up, secured, and being used by December 1993. The lab manager reported that she installed no other software on the system besides the C.N.S. software. Of the C.N.S. software, classes at School B used primarily reading and math software modules, and a few also used social studies lessons.

Staff Development and Training

The lab manager reported that she received three full days of initial training (before classes started using the lab) from a Waterford staff developer. This training including using the system software, setting up classes and enrolling students in the

system, troubleshooting hardware problems like system failures, and generating reports. She was highly satisfied with all aspects of this training, including topics covered, the length of the training, the staff developer's manner of presenting the material, and accompanying printed handouts. She felt the initial training covered all areas that she needed in order to get started with classes.

Teachers were not as satisfied with their initial training. They all reported receiving two 2-hour sessions of training, but nearly all felt that this was not sufficient for them to begin working with their students in the lab. They reported that almost all of this time was spent using the educational software on the system, but that there were other topics they wished had been covered, such as basic computer operations, writing with the computer, starting and operating the computer system, and troubleshooting problems that might come up. Most felt they were not prepared enough, or comfortable enough, to use the system and the software well. One teacher said that she did not understand the programs. Another thought that she had enough training to begin working with students, but only barely: "We could not operate the computers or understand the programs." Altogether, teachers gave low ratings to all aspects of the initial training: the time allocated for training, the topics covered, the staff developer's manner of presenting the material, and the printed material they received. Almost every teacher also thought that

their students had not received enough initial training to prepare them to work with the software.

Ongoing Assistance and Curriculum Connections

All teachers reported that they continued to meet with the staff developer weekly after their students had begun using the lab mostly to learn more about the software that the students were using. They also all said that they attempted to connect the instruction students received in the lab with their classroom instruction, for instance, by making classroom social studies lessons tie in with social studies software lessons in the lab. The lab manager provided help in making these connections. All the teachers felt, however, that the software did not fit well into their classroom work. They felt there was not enough software in the content areas they covered in class and that its topics were not well coordinated with their curriculum.

The lab manager reported that she did not need much help after the initial training from the staff developer, who subsequently spent most of her one day a week at the school working with the students in the lab. Sometimes the staff developer also worked with the school's computer teacher, who worked in the I.L.S. lab only one day a week.

Operation of the I.L.S. System

According to the lab manager, system problems would occur from time to time. Sometimes, for instance, the enroll module froze (stopped operating) in the middle of operation. A few times the entire system crashed (stopped functioning) and she was

unable to get it started again. The lab manager indicated that she was somewhat concerned about the integrator's responsiveness to such problems, since it took them from a couple of days up to (at least on one occasion) two weeks to get to the school and fix the problem.

The lab manager said that she regularly used the report function of the software, generating what the system calls "lesson reports by student," telling what lessons individual students had covered and how well they did on them and how long they spent on each. Teachers indicated that they received these reports, but with few exceptions they did not find them very useful, primarily because they felt the software did not coordinate well with their own curriculum.

A majority of the teachers indicated that they were involved during the year with placing their students in the system, or in changing their placement. None had any problems with the way the I.L.S. software handled student placement and progress through the lessons. The lab manager reported that she discussed changing student placements with the teachers, and that she would then make the agreed upon changes in the system software.

Benefits for Students and Ongoing Issues

Several teachers thought that the way the I.L.S. software drilled and reviewed skills was good for students' individual progress. Nearly as many other teachers, however, thought the program's academic benefits were limited because the software was not coordinated with their curriculum. One teacher commented

that the software could be beneficial if it were "coordinated with curriculum, not just dumped on us."

Several teachers and the lab manager indicated that the students found the software boring, that there was too much repetition, and that the software tended to stay on the same lesson too long. One teacher said her students initially looked forward to using the computers, but quickly became bored with the lessons. A few teachers, though, found that their students enjoyed the lab, and thought the software was fun.

Part of the reason for students' boredom may be attributable to their having been placed incorrectly and having inappropriate lessons chosen for them. Both of these tasks are time-consuming and require detailed knowledge about students and the I.L.S. software. The lab manager explained that many teachers were frustrated because they wanted time to sit with her and discuss their students. They also wanted time to explain what they were doing in their classroom curriculum so that the lab manager could select appropriate software lessons for the students. The only time they had to meet with the lab manager, however, was when they were with the students in their lab periods.

Another ongoing issue in School B related to the time it takes to learn how to use an I.L.S. effectively. As explained above, teachers were generally dissatisfied with their initial training for use of the lab. Several of these teachers noted that after students had started using the lab, however, they realized that they had learned enough for the time being, and

that learning more at first would have been an overload. It was only after half a year of student use of the lab that some teachers felt ready to go on to learning how to do more than have students use the individualized lessons. They were now ready to discuss in greater depth how to integrate the use of these computers into their classroom curriculum, and to learn how to use applications like a writing program that is on the system. These teachers indicated that the staff developer from Waterford was interested in working on these aspects with them, and was planning sessions for this purpose.

Academic Achievement

Standardized achievement tests in reading and mathematics were administered to all students in spring 1994. As indicated in Table 1, there were no significant differences in normal curve equivalent scores in reading between program participants and the rest-of-school population at any grade level.

Similarly, in math, and as shown in Table 2, although there was a trend favoring the rest-of-school population for the third grade (F=2.1; df 1,2060; p<0.15), there were no significant differences between Titan students and the rest of the school in grades 4 or 5.

CAPITAL SCHOOLS

Titan was responsible for four elementary schools in the capital funds phase of the I.S.L. project. Because the labs were ready for operation so late in the year, only setup and instal-

Table 1

Comparison of Spring 1994 Reading Normal Curve Equivalent Scores of Titan Program Students and the Rest of School

	Program Students			Rest of School			
	N	Mean	S.D.	N	Mean	S.D.	P
Grade 3	95	36.3	20.1	1,983	44.6	22.7	NS
Grade 4	127	38.7	21.8	1,949	44.7	24.5	NS
Grade 5	103	45.8	19.8	2,095	47.0	22.2	NS

According to analysis of variance tests, there were no significant differences between the reading scores of program students and the rest-of-school population at different grade levels.

Table 2

Comparison of Spring 1994 Mathematics Normal Curve Equivalent Scores of Titan Program Students and the Rest of School

	Program Students			Rest of School			
	N	Mean	S.D.	N	Mean	S.D.	P
Grade 3	92	43.3	19.5	1,985	44.6	24.0	0.15
Grade 4	124	43.6	19.7	1,951	49.7	22.8	NS
Grade 5	101	50.2	21.5	2,089	53.1	22.1	NS

- According to an analysis of variance test, there was a slight trend toward rest-of-school scores being higher than program students in grade 3 (F=2.1; df 1,2060; p<0.15, although there were no significant differences in the other grades.

lation, initial training issues, and other initial decisions are described here.

Setup and Installation of I.L.S. Labs

Administrators in the capital phase schools reported that district office personnel (usually the district's computer coordinator) had made decisions about which integrator to use. As far as administrators knew, their districts had chosen C.N.S. either because they had already worked with them or because C.N.S. had the most open management system. In one case C.N.S. was chosen because of the company's policy of not charging extra at a later date for adding more computers to the network.

The labs in the four schools were not ready to use until March or early April 1994. Both administrators and lab managers reported problems with delivery and installation of the lab equipment. In several cases, Apple took a long time to ship the computer equipment because it was waiting for a new line of Macintoshs (the LC575) to be ready. This new version was an upgrade that Apple provided at the same price as the older computers would have cost, but it meant a considerable delay in getting started. One school reported that it took a long time to get the security devices delivered and installed. According to the lab managers, none of these problems were caused by C.N.S. To the contrary, lab managers and administrators praised C.N.S. for its efforts to facilitate and coordinate delivery and installation of equipment.

Initial Training and Ongoing Support

At the four schools half of the administrators and all of the lab managers interviewed had participated in some of the initial training. Topics covered included installing and using the system software, enrolling and placing students in the system, using the lesson software, troubleshooting hardware problems, and generating and analyzing reports. The amount of time spent in this training varied widely, totalling three hours for one of the schools, about six hours for another, 18 hours for the third, and 36 for the last.

Lab managers in three of the schools reported being highly satisfied with the amount of training they received, the topics covered, the manner in which it was presented, and the materials they received. The other school, in which the lab manager was not as satisfied, was the one which had received the least training. Further, the lab manager in the school with the second least amount of training time was unhappy about aspects of the initial training. Reasons for this dissatisfaction will be examined below.

The two schools that received at least several days of initial training seemed happy with it in all respects. One manager said that she "learned so much" from both the C.N.S. representative and the Waterford staff developer, and indicated that the C.N.S. representative was "very responsive and very professional." The other was very pleased with the Waterford

staff developer, who conducted between three and four days of workshops with all the teachers in the school.

The lab managers at the other two schools reported problems. One said that she knew a lot about computers already, so training was not so important for her, but that teachers in the school weren't given enough initial training. Before the students started using the lab, the staff had half a day with the Waterford staff developer. Unfortunately, the system went down at the beginning of this session, and by the time it went back up there was only an hour left, and the staff developer spent most of this time talking about Waterford, barely getting to using the computers. Because of this, the teachers were very angry. Since then, when the staff developer comes to the school, according to the lab manager, she circulates and talks to the children. She is, however, planning to have two sessions with teachers in the future.

In the school that received six hours of initial training, the situation was different. Here, the C.N.S. representative worked with the manager on one day, and students started coming the next. Unfortunately, when the first class arrived a system error occurred, with nobody on hand to fix it, and the lab could not be used that day at all. Since this time the staff developer from Waterford doesn't seem to have anything in mind to cover when she visits the school and just asks what the lab manager wants to know.

General Issues Identified by the Schools

These two schools identified several issues involved in the initial I.L.S. training. One involves the amount of staff development time teachers and lab managers need before children start using the lab. Although lab managers are often already comfortable with computers, this is not usually the case with other teachers, who feel the need for considerable guidance and instruction before they are comfortable. In this regard, it is significant that the two schools that received the least amount of initial training time both reported dissatisfaction with the training. The material covered in the shorter period was not enough to ensure the smooth operation of the lab without the presence of an outside expert.

Another issue relates to who should provide the initial training for lab managers and teachers. The integrator in this case split a variety of training and support roles between C.N.S. and Waterford. C.N.S. was responsible for all technical support, including installation and setup, and problems with the hardware and software, while Waterford was responsible for educational uses of the software, and connecting software lessons to other curricula. Both the technical and the educational expertise are necessary to make the project a success. In this instance all four capital schools praised the C.N.S. representative lavishly for his technical support, his responsiveness to their problems, his professionalism, and his manner of relating to them, while two of the schools complained about the lack of educational

support. Not enough time was dedicated to working with teachers before lab operation began, and in one case only C.N.S. provided this initial training. Lab managers and administrators indicated that this problem may have been caused by the late starting date, which interfered with staff developers' schedules.

A third issue involves what teachers need to know before they start using the lab. As with School B in the previous section, teachers can feel the need for an amount of initial training which they later realize they did not need at that time. They may later realize that they did not really need to know very much at first, or that a competent lab manager is what an I.L.S. lab really needs. The issue of perceived vs. actual need may thus cause unhappiness at first, but may be more or less resolved later, and when teachers have used the system for a while, they may then be ready to go more deeply into how to use the system.

Perceptions of the I.L.S. System So Far

School personnel also had opinions about the operation and effectiveness of the I.L.S system which had been in operation in their schools for nearly two months.

Two schools reported that the system had gone down once or twice, but that C.N.S. had come very quickly to restore it to operation, and two of the schools indicated that they had begun generating class reports from the system, as well as some individualized student logs. Lab managers were not sure if teachers were using these reports yet.

Lab managers at three of the schools were happy with the I.L.S. as a whole. Although students and teachers were still at the early stages of using the software, all managers thought that using such software would be academically beneficial to students. One explained that "The kids love it. I like the software. The different games drill on necessary skills." Another said that "Teachers think the lessons are good follow-up for their classroom work. I think it's a terrific program and it's going to do wonders for the school."

Two of these schools were also using the lab for more than the C.N.S. lessons. One school had a computer club which had written and published a newspaper for the school. In the other, teachers were beginning to use the lab for their own writing.

The fourth school was not as happy with the I.L.S. software. This school already had an extensive background using computers as tools for creating publications, creating databases, using spreadsheets, and telecommunications. Furthermore, administrators had supplied each of the upper grade classrooms with three or four Macintoshes, and the labs in the lower grades were in the process of networking with the other computers. Teachers were already familiar with much commercial software, and the school in fact already had some of the software that C.N.S. used. According to the lab manager, the school thought it was getting diagnostic/prescriptive software with the I.L.S., and were disappointed with its diagnoses. Because of the school's history with computers and orientation toward using them, teachers at

this school did not want to use computers as what the lab manager called "electronic workbooks." The lab manager explained that, "The whole technology program in this school was implemented with respect for individual teachers, and each teacher is doing things in a different way." This school was unaware of what kind of software they were choosing when the district selected Titan as the integrator. However, the lab manager emphasized that they appreciated the efforts of C.N.S. in performing all its roles, and that it was the I.L.S. itself which they did not like.

III. CONCLUSIONS AND RECOMMENDATIONS

Two kinds of findings are reflected in this report. One concerns the performance of Titan as an educational systems integrator, while the other focuses on the hardware and software that make up the I.L.S. itself.

In this project, Titan delegated its role as educational systems integrator to C.N.S., which assumed responsibility for installing and maintaining hardware and software, and to a large extent training lab managers how to use it. One of the clearest findings of this study was the esteem in which C.N.S. itself was held by every school. They were unanimous in their opinion that the C.N.S. representative was professional, knowledgeable, responsive to problems and needs, and a pleasure to work with. There was only one area in which some complaint about C.N.S.' performance was voiced, and that was the length of time it occasionally took C.N.S. to get to one of the schools to fix a system problem. This is a serious concern, since time spent waiting for service can mean time during which students cannot use the computers. It should be noted, however, that the demands on a limited number of individuals by several schools can often be taxing, and that this complaint was voiced in only one of the six schools.

C.N.S. had subcontracted the teacher training aspect of the program to Waterford, which received mixed reviews. Half of the schools were very satisfied with the training they received, while the other half voiced dissatisfaction about initial training in several areas: the amount of time allocated for

training; the topics covered; and, in one case, the trainer's manner of presenting the topics. Also, these same schools were not happy with the trainer's ongoing work with school staff.

Respondents' comments shed light on several aspects of the training process, and raise several questions about what is necessary for successful implementation of an I.L.S. project. First, what kinds of training are necessary for teachers and lab managers to use an I.L.S., and who is responsible for providing it? On the one hand, lab managers and, to some extent, teachers, need technical training in how to operate the computer, use the system software and the students' software, and troubleshoot hardware and software problems. On the other hand, they need to understand how to use the software for educational purposes. The data seem to indicate some confusion about who was responsible for which kind of training. C.N.S. was clearly responsible for the main technical aspects of it, while Waterford dealt with most educational matters. Waterford's role in most schools was also to show staff how to use the computer and the system software. In one school, however, a Waterford staff developer conducted all the training before students started using the lab, and in another the Waterford trainer did hardly any training. Also, respondents in two schools complained that, after students started arriving, the Waterford trainers didn't seem to know what to do on their weekly visits.

A second aspect involves the timing of the training. Several of the schools got a later than expected start in

implementing the project, and in these schools respondents tended to complain about the amount of training they received. It is possible that, in these cases, had it been feasible to follow the original schedule, more initial training would have been provided. Also, in some cases technical problems with machinery interfered with part of the original training time.

Timing was also important in the question of what should be taught at which stage of the project. What do teachers need to know to start using an I.L.S. with students, and what could they learn later? Since a lab manager was on hand for technical support in almost every case in this project, it is doubtful that the teachers needed to know much about operating the system. In fact, several teachers remarked that, although at the time they wanted more initial training than they received, upon reflection they realized that they did know enough to begin using the I.L.S. Later on, the kind of training they wanted tended to involve using various computer tools such as word processors, and not necessarily the I.L.S. drill software. One implication of this funding is that perhaps teachers' original assessments of their training needs may not be consistent with what they really need to learn. Another is that the trainers should be clearer about what teachers need to know at the beginning, and what can be covered later.

A third area involves the role of the lab manager. One conclusion that emerges from data gathered in this study is that the lab manager was a key person in insuring the success of the project. The lab manager was typically someone who already

possessed some knowledge, and often considerable knowledge, about computers. Trainers from C.N.S. or Waterford spent a good deal of time with managers to ensure that they could operate the system software, enroll students, change placements, and so on. As the project was implemented, teachers relied on these lab managers, since they were the ones trained to use the system. Several schools, in fact, voiced doubts about whether the project could have succeeded as well as it did without a knowledgeable lab manager or, in one case, a subject-area teacher very experienced with computers.

The role of the lab manager is relevant to the issue of teachers' preparation and ongoing training for using the lab. Teachers were more or less satisfied with their initial training, but as students started using the lab, smooth implementation seemed to depend on how well lab managers were prepared. At all stages of the project, but especially at the beginning, the crucial factor was knowing how to use the I.L.S. and keeping it working correctly. Teachers could of course help students with the lesson software, and sometimes problems occurred which lab managers could not handle, but the bulk of the activity and responsibility involved lab managers making sure the I.L.S. was delivering software lessons to students.

Further, teachers in several schools reported that when they began thinking of how to integrate I.L.S. lessons with their own classroom curriculum, they relied on the lab manager for help rather than a teacher trainer. In some schools, the Waterford

staff developer worked with teachers in thinking through this integration process, but not in all of them. Two schools reported that, after the initial training, the staff developers' visits to the school involved circulating and helping students. In the two grantback schools, which operated through most of the year, teachers worked well with the trainer in one, but in the other they seemed to rely solely on the lab manager.

Taken together, these findings present a somewhat inconsistent picture of the training provided to teachers. The amount of initial training time varied widely among schools. In some schools teachers were satisfied with the topics covered, while in others they were not. In some cases, teachers could be satisfied with little initial training because they in fact did not need to know very much. Teachers' level of satisfaction sometimes seemed to depend on how much they thought they needed to know, rather than what they actually needed to know. Finally, in some schools the staff developer worked well with teachers after the initial training, while in others there was not much interaction.

Regarding perceptions of the I.L.S. itself, findings are also mixed. The majority of schools seemed happy with the system, but some expressed reservations.

One area of dissatisfaction was schools' involvement in decision making about the I.L.S. project. Most schools reported they had little or no input into initial decisions about what integrator of software to use, and teachers had even less say.

Some teachers and administrators expressed skepticism about the project because the school was not involved in planning it, because they saw it as imposed on them, or because they doubted that outsiders would know what their schools needed. The data show that these fears were overcome after integrators started working with schools. Many comments, however, reflect the lack of fit between I.L.S. software and school curriculum, and some respondents believed that this could have been alleviated if they, or the school as a whole, had been involved in making decisions about software.

Opinions about the software itself were also mixed. Although many teachers thought the lesson software was beneficial to students, others said students found it boring or uninteresting. Also, as noted above, a considerable number of teachers said that the software did not fit their own schools' curriculum, so that they had difficulty integrating it into classroom activities. Finally, one of the capital schools found that the type of drill software on the I.L.S. system did not match its educational goals.

Student achievement scores showed no significant differences in reading between program participants and the rest-of-school population. Mathematics scores indicated a trend towards differences in grade 3. However, this trend favored the rest-of-school population, not program participants.

Based on these evaluation findings, OER makes the following recommendations:

- Reexamine the teacher training process to clarify such aspects as how much and what kinds of training teachers need before students begin to use the I.L.S. system, and what kind of ongoing support teachers need to ensure successful student use of the lab.

- Clarify more completely the roles of C.N.S. and Waterford in delivering technical and educational support to schools.

- Consider how the program expects schools to integrate use of the I.L.S. lab with the rest of their school curricula, and systems integrators will work with schools to effect this integration.